Project Initiation and Planning Procedure
OETI-PMP-02

Environmental Protection Agency
Office of Enterprise Technology and Innovation (OETI)

September 26, 2007 – Version 1.2

Document Change History

Version	Date	Author	Description of Changes
1.1	February 2, 2007	Judy Lum	Clarify role of Project Manager in determining applicability of project management procedures
1.2	September 26, 2007	Judy Lum	Correct Complexity Model score ranges and make edits to the footer info on the appendices

Contents

1. Introduction

This document defines the process by which staff within the Environmental Protection Agency (EPA)'s Office of Enterprise Technology and Innovation (OETI) performs project initiation and planning activities. This document incorporates industry best practices, EPA policies, and Project Management Institute (PMI) standards for project management.

1.1 Purpose

This document defines the approach, process flow, and relevant standards by which OETI project staff performs project initiation and planning activities and identifies participants and their responsibilities. A project is defined as "a temporary endeavor undertaken to create a unique product, service or result."[1] The purpose of this procedure is to define the steps that are part of the project initiation and planning phases and provide a procedure for developing the Project Management Plan.

1.2 Background

According to PMI, project management is needed to apply "knowledge, skills, tools and techniques to project activities to meet project requirements."[2] Project management is essential to provide structure and discipline across all phases of the project lifecycle illustrated in Figure 1-1. This procedure addresses activities performed in the first two phases of the life cycle, initiation and planning. The initiation and project planning processes and the resulting Project Management Plan provide the foundation for all other project management processes and plans. While not all processes apply to each project that OETI initiates, the project team can use this procedure as a guideline to determine which processes are needed to execute the project effectively based on its size, scope, and complexity. These factors, and how to apply them to make decisions, are discussed in Section 2.2 and Section 4 of this procedure.

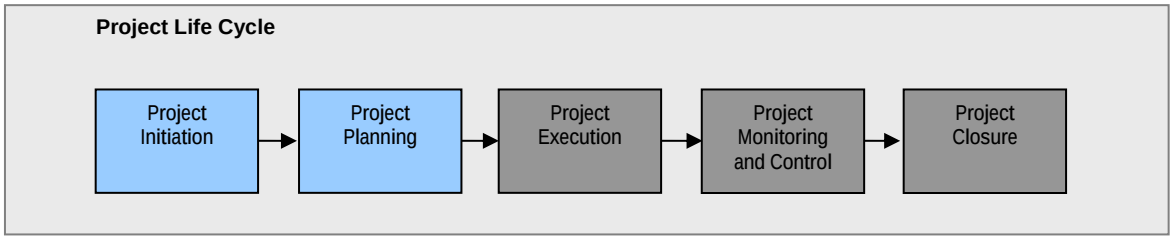

Figure 1-1 Project Life Cycle Phases

Project initiation begins once a need or requirement is identified and a project idea or concept is defined. The PMI identifies initiation activities as definition of the preliminary scope statement through the approval of the project. For EPA, federal requirements for completing and submitting the documentation supporting the approval process may extend the initiation phase so that it actually overlaps with the planning phase, depending on the size and complexity of the project. Therefore, many planning activities can take place before funding or final project approval. Initiation includes project charter and preliminary scope definition and project approval. Planning includes all planning

[1] Project Management Institute, The Project Management Body of Knowledge *(PMBOK®)*, Third Edition. 2004 Appendix B, Section B.3 p 327.

[2] Project Management Institute, The Project Management Body of Knowledge *(PMBOK®)*, Third Edition. 2004 Chapter 1, Section 1.3, p 23.

activities for the project, including cost estimates and development of preliminary schedules. High level decisions regarding other project processes are also made during planning. For example, the project team may determine the relevance and scope of quality management and organizational change management activities during initial planning. They may also decide how these processes will be executed for the project and to what extent.

The project team documents the decisions made during the initiation and planning processes in the Project Management Plan. Content for the Project Management Plan evolves over the initiation and planning phases and on into the execution phase. The Project Management Plan is a living document and its users update it continually to reflect changes to the project.

There is a high degree of integration across the project management processes. Table 1-1 identifies points where the processes defined in the project management procedures are integrated by the inputs and outputs that link them together. Outputs from one process often feed into another process as inputs. A good example of this connection is the approval of change requests. Depending on the nature of the request, any or all of the processes covered by the procedures listed may be affected and thus, the approved change request is an input to those processes. Table 1-1 provides a listing of OETI's project management procedures with major inputs and outputs for each process.

Table 1-1. Procedure Integration Points

Procedure	Processes Covered	Inputs	Outputs
OETI-PMP-01 Procedure Development Guide	Development of a Procedure	▪ Project Management Plan (PMP) ▪ Approved Change Requests ▪ Project Need/Requirement	▪ New Procedure
OETI-PMP-02 Project Initiation and Planning Procedure	Project Initiation Project Planning	▪ Organizational Need or Requirement ▪ Approved Change Requests ▪ Updates to Project Plans (from re-planning and re-baselining)	▪ Project Scope Statement/Charter ▪ Preliminary Cost Estimate ▪ PMP ▪ Procurement Action (if applicable) ▪ Risks and Issues
OETI-PMP-03 Project Schedule and Cost Baseline Procedure	Development of a Baseline Schedule Development of Baseline Cost	▪ PMP ▪ Preliminary Cost Estimate	▪ Baseline Schedule ▪ Baseline Cost ▪ Risks and Issues
OETI-PMP-04 Project Status, Reporting and Forecasting Procedure	Process for Managing Schedule Process for Generating Earned Value metrics Process for Regular Reporting	▪ PMP ▪ Baseline Schedule ▪ Baseline Cost ▪ Risks and Issues	▪ Updated Schedule (re-plans, re-baselines) ▪ Earned Value metrics ▪ Reports/Dashboard ▪ Change Requests ▪ Risks and Issues
OETI-PMP-05 Risk Management Procedure	Process for Managing and Mitigating Risks	▪ PMP ▪ Risks ▪ Quality Reports/Metrics	▪ Risk Management Plan ▪ Change Requests ▪ Risks
OETI-PMP-06 Issue Management Procedure	Process for Managing and Resolving Issues	▪ PMP ▪ Issues ▪ Quality Reports/Metrics	▪ Issue Management Plan ▪ Change Requests ▪ Risks

Procedure	Processes Covered	Inputs	Outputs
OETI-PMP-07 Requirements Management Procedure	Process for Managing Requirements	▪ PMP ▪ Requirements	▪ Requirements Management Plan ▪ Baselined Requirements ▪ Change Requests ▪ Risks and Issues
OETI-PMP-08 Change Control Procedure	Process for Managing Change Requests	▪ Change Requests ▪ Change in Requirements	▪ Approved Change Requests ▪ Risks and Issues
OETI-PMP-09 Quality Management Procedure	Process for Managing Project Quality	▪ PMP ▪ QASP/SLAs/Performance Criteria ▪ Risks and Issues	▪ Quality Assurance Plan ▪ Quality Reports/Metrics ▪ Process Improvements ▪ Change Requests ▪ Risks and Issues
OETI-PMP-10 Procurement Management Procedure	Process for Initiating a Procurement Process for Managing a Contract	▪ PMP ▪ Procurement or Contract Action	▪ Contract File ▪ Change Requests ▪ Risks and Issues ▪ QASP/SLAs/Performance Criteria
OETI-PMP-11 Organizational Change Management Procedure	Process for Defining and Managing the Change Process for Managing Communications Process for Workforce Planning Process for Developing Training	▪ PMP	▪ Change Management Plan ▪ Training Plan ▪ Communications Plan ▪ Change Requests ▪ Risks and Issues
OETI-PMP-12 Document Management Procedure	Process for Managing Project Artifacts	▪ PMP ▪ Project Artifacts ▪ Contract File (if applicable)	▪ Document Management Project Standards ▪ Stored Project Artifacts ▪ Stored Contract Files
OETI-PMP-13 Project Closure Procedure	Process for Closing a Project	▪ PMP	▪ Administrative and Contract Closure Procedures ▪ Lessons Learned ▪ Project Artifacts

2. Approach

This procedure defines the process of project initiation and planning including the requirements based on scalability. It should be noted that project planning requirements vary based on the size of a project managed both from an EPA policy perspective and from industry best practice because it is related to economic factors associated with project management. This procedure incorporates required EPA processes for project planning and refers to EPA policy and guidance as needed.

2.1 Assumptions

The project initiation and planning procedure assumes the following:

- OETI may manage several projects of varying size and complexity.
- Projects may be dependent on an overall project plan or may be independent projects managed under a portfolio of projects.
- For many OETI projects, the project team may engage in project planning activities during both the project initiation and project planning phases as they must execute many of these activities prior to final project approval for large, medium and sometimes small projects.
- Decisions made during project initiation and planning determine which procedures apply to the project. For example, if the project team decides to procure a product or service from a vendor, the *PMP-10 Procurement Management Procedure* applies.
- External requirements may dictate project direction and activities. External requirements may override the process steps defined within this procedure. For example, EPA's Office of Environmental Information (OEI) issues the System Life Cycle Management (SLCM) Policy and corresponding procedures for operating and designing agency information systems. OETI system projects are required to comply with OEI SLCM Policy and related procedures. Where necessary to enhance project management and success of OETI system projects, OETI project management procedures add to the agency's minimum requirements articulated in OEI's SLCM Policy and procedures. The OEI SLCM Policy applies only for system projects and not for non-system projects.
- Project planning is an ongoing process and the users of this procedure continually update project management plans and processes to reflect re-planning activities, approved change requests and new requirements throughout the project lifecycle.
- This procedure is based on industry standards from PMI and knowledge of existing EPA policy.

2.2 Scalability

The project initiation and planning procedure steps produce the decisions and guidance that provide the foundation for project management activities for each new project. For this reason, this procedure applies for all new projects initiated by OETI. However, the procedure can be scaled relative to the type of project (system or non-system), size, cost, risk and Project Complexity Model Rating for the project. The Project Complexity Model, presented in Section 4.1, is a project management tool used to evaluate the overall complexity for a new project. The model provides a complexity rating based on answers to questions on various project parameters. The Complexity Rating simply provides a starting point for beginning the initiation and planning activities. The rating is one of several factors that the project team must analyze. Other factors, including the unique requirements of the project, resource, schedule and cost variables and project constraints, also determine which processes

should be followed. The larger and more complex the project, the greater the need for more extensive project management processes in order to manage scope effectively, mitigate risks, resolve issues, and monitor project status. Sections 4.1 and 4.8 provide additional guidance for identifying triggers for determining scalability during project planning activities. The Project Manager may decide that OETI's project management procedures are not applicable for some projects. In these specific instances, the projects will follow existing EPA policy and procedures or receive formal waivers.

2.3 Best Practices

The OETI project management vision includes the employment of best practices from both industry and the EPA. This procedure incorporates the following best practices and existing regulations and policies:

- **EPA regulations and standards**
  - The EPA Interim Agency System Life Cycle Management Procedures. Available at: http://intranet.epa.gov/otop/policies/Extended_InterimProcedures.pdf
  - EPA Directive 2100.3, Information Technology Capital Planning and Investment Control (CPIC). Available at http://intranet.epa.gov/oei/imitpolicy/qic/ciopolicy/2100.3.pdf
  - EPA Directive 2100.5, System Life Cycle Management Policy. Available at http://intranet.epa.gov/oei/imitpolicy/
  - EPA Directive 2120.3, Enterprise Architecture Policy. Available at http://intranet.epa.gov/oei/imitpolicy/
  - EPA Directive 2195.1A4, Agency Network Security Policy. Available at: http://intranet.epa.gov/oei/imitpolicy/
  - Implementing CPIC Lite – The Capital Planning and Investment Control (CPIC) Process for Non-Major Investments. Available at http://intranet.epa.gov/cpic/fy2006/cpiclite/
  - Sample Memorandum – CPIC Lite Annual Certification. Available at: http://intranet.epa.gov/cpic/fy2006/cpiclite/
  - EPA Exhibit 300 CPIC Guidance. Available at: http://intranet.epa.gov/cpic/
  - CPIC Lite Implementation Guidance for the FY 2007 OMB Submission. Available at: http://intranet.epa.gov/cpic/
  - CPIC Lite Investment Proposal Form. Available at: http://intranet.epa.gov/cpic/cpiclite/
  - Template for Capital Asset Plan and Business Case Summary Exhibit 300. Available at: http://intranet.epa.gov/cpic/
- **Federal regulations, industry standards and best practices**
  - E-Gov Initiatives at a Glance. Available at: http://intranet.epa.gov/cpic/fy2006/cpiclite/att-c1_cpiclite-e-gov-initiatives.pdf
  - E-Gov Initiatives and Lines of Business/Subfunctions They Support. Available at: http://intranet.epa.gov/cpic/fy2006/cpiclite/att-c2_cpiclite-e-gov-lob.pdf
  - OMB Guidance for Completion of Exhibit 300 http://www.whitehouse.gov/omb/circulars/a11/current_year/s300.pdf
  - Project Management Institute, The Project Management Body of Knowledge (PMBOK®), Third Edition. 2004. Chapters 1-5 and Appendix B.

3. Roles and Responsibilities

Table 3-1 presents the roles and responsibilities for OETI project staff involved in project initiation and planning activities. This table lists functions or tasks that each project role performs. While each role will be assigned to an individual staff member, an individual may perform multiple roles for a project.

Table 3-1. Project Planning Roles and Responsibilities

Role	Responsibilities
Project Sponsor	▪ May identify need or requirement for a new project ▪ Provides executive sponsorship for the project by endorsing and communicating the benefits and progress of the project to peers and senior executives ▪ May be required to provide interim or final project approval ▪ May approve project ▪ May assign completion of the Project Complexity Model to appropriate resource
Next Level Supervisor or Director, OETI	▪ Makes the determination if the proposed project should be continued or stopped ▪ Reviews business case to determine whether the project need exists (internal OETI checkpoint) ▪ May approve project ▪ May be required to provide interim or final project approval
Project Requestor	▪ May identify need or requirement for a new project ▪ May complete the Project Complexity Model ▪ Completes or assigns completion of required project documentation NOTE: The Project Requestor role may overlap with other project roles (e.g., Project Manager) as project roles may not yet be assigned in the project initiation phase.
Project Manager	▪ May complete Project Complexity Model ▪ Provides capital planning information needed to meet CPIC requirements ▪ Develops the Project Management Plan ▪ Completes or assigns completion of relevant Project Management Plans ▪ Reviews and approves the Project Management Plans ▪ Reviews project plans to determine whether the project should move from one life cycle phase to another
Planning and Evaluation Team Lead	▪ Provides capital planning support to the project ▪ Outlines Exhibit 300/Exhibit 53 reporting requirements ▪ Reviews submitted documentation for regulatory compliance ▪ Provides guidance to Project Manager for updating the initial business case ▪ Assists with the submission of budgetary information to the Chief Financial Officer and the Office of Management and Budget (OMB)
Project Team Lead	▪ Provides the input for project planning activities ▪ Provides capital planning information needed to meet CPIC requirements ▪ Develops applicable project and mitigation plans as necessary ▪ Provides review and concurrence with project plans
Project Team Member	▪ Identifies work scope to support project work breakdown structure (WBS), including time durations, resources required, and materials/tools required

Role	Responsibilities
	▪ May participate in planning, re-planning and provide updates to applicable Project Management Plans

4. Procedure

This section presents the process flow for project initiation and planning and describes each step of the process in detail.

4.1 Process Flow Diagram

Figure 4-1, presented on the next page, identifies the process for project initiation and planning for a new project. The process originates with an idea that is typically generated by an organizational need or requirement. Initiation activities begin when the project is sponsored within the organization. The level of sponsorship needed is driven by the magnitude of the initial requirement. The Project Requestor then completes the activities required to receive formal approval and funding, depending on the size and complexity of the project. Project planning typically overlaps with initiation activities for OETI projects due to the documentation required to obtain external approval. Planning, however, occurs over the life of the project and provides the foundation for all other project activities. This figure represents the project initiation and planning activities to be performed by OETI staff.

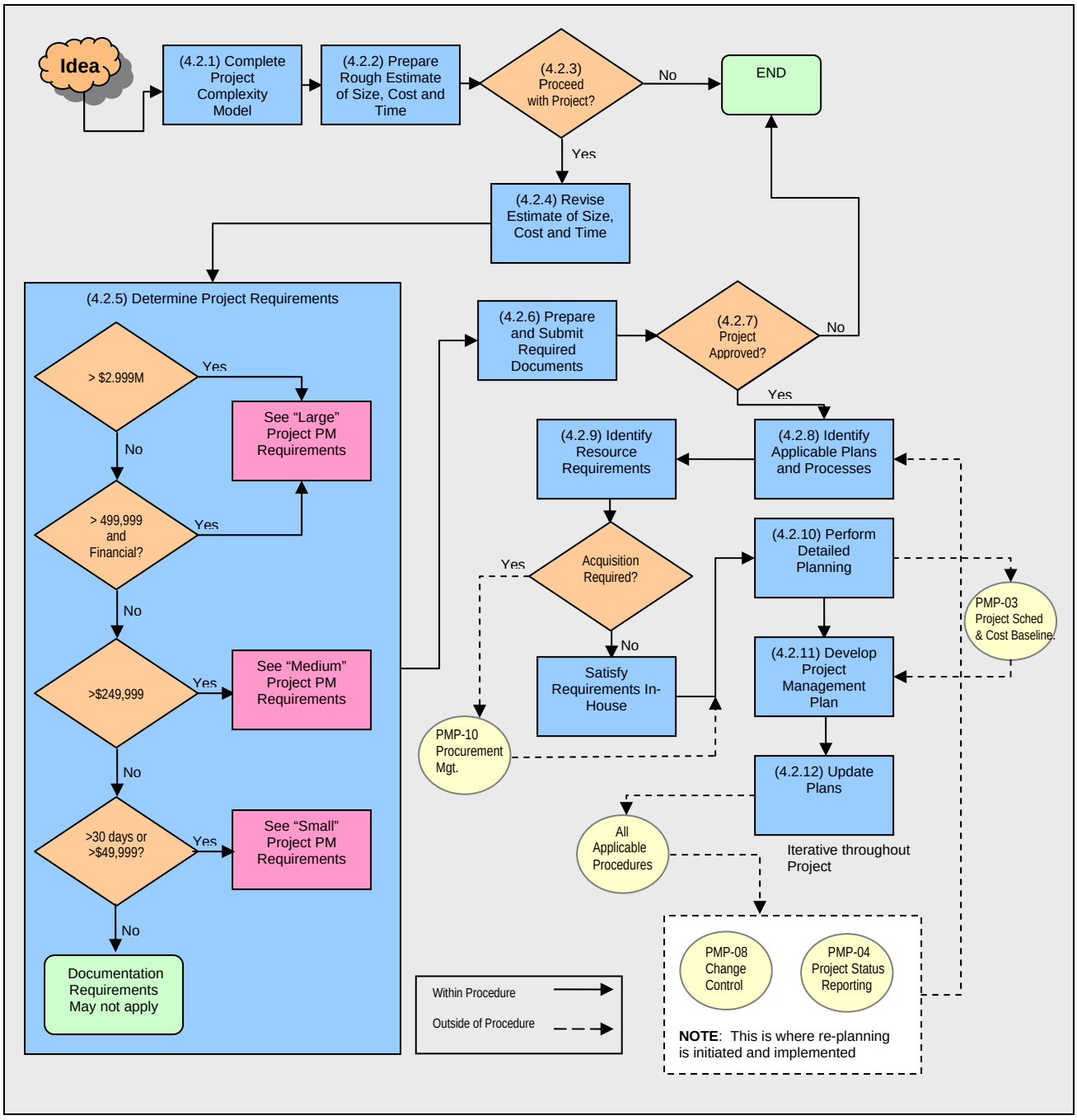

Figure 4-1. Project Initiation and Planning Process

4.2 Steps

The following sections describe the steps of the project initiation and planning process shown in Figure 4-1 and the roles involved with its execution.

4.2.1 *Complete Project Complexity Model*

The Project Complexity Model is a tool that is used during the initiation phase of the project to better understand project requirements, identify areas of uncertainty and risk, and to scale project processes appropriately to meet project requirements.

To begin the procedure, the Project Requestor uses the Project Complexity Model illustrated in Appendix F to get an understanding of the overall complexity of the proposed project. The Project Requestor accesses the EPA_Complexity_Model.xls. The electronic version of this file is stored on the OCFO website under Policies and Documents. The Project Requestor downloads a local copy of the file and selects answers to questions in the categories of Cost, Staffing, Schedule, Customers, Business Impact, Technology, Sponsorship and Risk. Note that instructions are included in the first tab of the model. Each of these categories plays a significant role in project initiation and planning activities as they are all key factors in determining project management requirements. Greater project uncertainty and risk in any of the categories may result in a higher complexity score for the project. The model calculates an overall total score and provides a corresponding complexity indicator of High, Medium, or Low. Based on the indicator identified for the project, the model provides a list of documentation typically required to address agency and federal requirements. More information on project requirements is provided in Section 4.2.5 and Table 4-2. In addition, after the project is approved, the Project Manager uses the complexity model rating when determining how to scale project processes for the project. Section 2.2 and Figure 2-1 provides information on scaling project management processes for approved projects.

For complexity model ratings of “High” or “Medium”, the Project Requestor analyzes the answers selected for each of the categories to determine which categories have the greatest amount of uncertainty and thus, the most impact on the overall score. High uncertainty in any of the areas may require additional action and analysis by the Project Requestor to complete the subsequent steps for obtaining project approval, define which processes to apply to the project and the level of rigor required, or complete the necessary planning to build the project plan. Individuals participating in project initiation and planning may use the results from this model to assist with their decision-making and analysis.

Examples of actions resulting from high uncertainty for each of the categories are presented in Table 4-1. These action items are suggestions for mitigating project risks in each of the categories identified. The Project Requestor may also need this additional analysis to complete external documentation requirements for project approval.

Table 4-1. Project Complexity Model Impact Analysis

Category	Concern	Suggested Action Items
Cost	Uncertainty related to amount, source or timing of funding	▪ Set aside larger amount of contingency funds (e.g., 30%) when developing budget estimate ▪ Prioritize tasks and identify those that are less critical and thus can potentially be moved to future project phases or possibly omitted ▪ Seek additional sources of funding or evaluate ability to reallocate funds from other projects or programs ▪ Add risk to Top Risk List related to funding
Staffing	Uncertainty related to adequacy or control of resources	▪ Evaluate whether needed staff can be hired or transferred to work on project ▪ Determine whether training classes can prepare existing staff to meet project skill requirements

Category	Concern	Suggested Action Items
		▪ Determine whether procurement of outside services is feasible ▪ Add risk to Top Risk List related to staffing
Schedule	Uncertainty related to project duration and extent of dependence on other project activities or outcomes	▪ Determine critical milestones and deadlines that cannot move and understand overall impact on tasks and phases within the schedule ▪ Build additional time into the schedule for delivery when inter- or intra-project dependencies are unavoidable ▪ Add risk to Top Risk List related to schedule
Customers	Uncertainty related to involvement and buy-in of customers	▪ Identify all stakeholders as early as possible and ensure that they are included in project communications ▪ Begin requirements definition process early and ensure all stakeholders have the option of participating in the requirements process ▪ Try to identify any customer concerns or objections to project as early as possible in project lifecycle and develop a detailed change management strategy to address these ▪ Add risk to Top Risk List related to customers
Business Impact	Uncertainty related to the importance of the project to the overall business/mission of the organization	▪ Clearly articulate the mission and goals of the project and the anticipated business impact and define why that is relevant for the stakeholders – communicate these messages as early as possible in the project lifecycle ▪ Develop a detailed communications plan that will reiterate the messages related to the impact of the project on overall business processes and requirements ▪ Add risk to Top Risk List related to business impact
Technology	Uncertainty related to the viability of technology and complexity of the requirements to implement	▪ Establish relationship/agreement with vendor (if commercial off-the-shelf [COTS] product) to ensure that there is a resolution process for product issues ▪ Ensure that resources are adequately trained on product technologies ▪ Begin data conversion planning early and ensure that adequate time is allocated for multiple mock conversions, testing, and data cleanup. ▪ Add risk to Top Risk List related to technology
Sponsorship	Uncertainty related to degree of commitment from the Project Sponsor	▪ Identify role of Sponsor(s) in project plan ▪ Build in activities (e.g., monthly meetings) at which Sponsors can be briefed on project activities and progress ▪ Ensure the Sponsors are apprised of significant issues and that they are involved at the top tier of the issue resolution process ▪ Add risk to Top Risk List related to sponsorship
Risk	Excessive number of unknowns and identified risks	▪ Document risks and mitigation strategies as early as possible in the project lifecycle and as part of the project plan

The Project Requestor performs the additional analysis and actions required to understand project inputs, constraints and risks. This knowledge is used to prepare initial estimates and determine if more research must be completed to effectively mitigate areas of high uncertainty.

4.2.2 *Prepare Rough Estimate of Size, Cost, and Time*

The Project Requestor prepares a rough estimate summary using personal experience with similar projects, results from the Project Complexity Model, agency experience with similar projects, and industry costing information for similar projects that includes the following items:

- Project description, including the business need
- Project goals and objectives
- Preliminary business case
- Summary of spending
- Security requirements
- Enterprise architecture overview
- Benefit/cost analysis

This rough budget estimate should include contingences in the range of 10-30% depending on the cost uncertainty and Project Complexity Model results. Additional guidance for developing cost estimates can be found in links in Appendices C and D of this document.

The estimates are completed by the Project Requestor and prepared for review and approval. The Project Requestor should refer to the Office of the Chief Financial Officer (OCFO), Office of Program Management (OPM) for appropriate project approval routing based on the size, cost, and complexity of the proposed project.

4.2.3 *Proceed with Project?*

The Project Requestor holds a discussion about the proposed project with his or her next-level supervisor and/or other required approvers to obtain either formal or informal approval to proceed with the project if the initial analysis provides support that the project is viable. The means for obtaining and communicating the approval depends on the size, scope, and complexity of the project and the OPM approval requirements. The Project Sponsor typically approves any project that meets the requirements for CPIC or CPIC Lite. For smaller projects, the approver is usually the next level supervisor. Based on the rough estimate, the Project Sponsor or next-level supervisor decides to proceed with or discontinue the suggested project. The decision will be made based on the following factors:

- Is there sponsorship for the project?
- Does the proposed project fulfill the business need?
- Does the proposed project meet EPA security requirements?
- Does the proposed project meet EPA enterprise architecture requirements?
- Does the benefit/cost justify the proposed expenditures?

If a decision to proceed is made, then the proposed project is communicated to the various directors and managers who will become stakeholders. This communication takes place during meetings and briefings to promote awareness of the proposed project. In addition, the Project Manager is formally

assigned to the project by the Project Sponsor. Transition of information and/or applicable documents is performed between the Project Requestor and the Project Manager, if applicable.

4.2.4 *Revise Estimate of Size, Cost, and Time*

After receiving approval to continue the project, the Project Manager prepares a revised estimate of the project scope incorporating information gained in Step 4.2.2. The following techniques should be used to generate a budget estimate:

- Develop a preliminary cost schedule using a top-down approach. This is done by identifying the end result, then working backward to identify the various major activities (tasks) necessary to reach the end result. The cost of each major activity (task) is then estimated.
- If the project includes software design, use a tool that assists with identifying the level of effort for software development activities.
- Use an estimating tool for estimating total effort, if applicable.
- Use past experience with similar projects from within the agency and within other federal agencies in the development of the budget estimate, if applicable.
- Contact vendors used by other federal agencies for similar projects to obtain estimates based on the vendor's past experience.

Appendix E contains a project planning template that can be used for the revised estimate. Appendix D contains additional guidelines for estimating costs.

4.2.5 *Determine Project Requirements*

The Project Manager determines if the project is considered large, medium, or small using the decision tree, complexity model rating, and the following criteria:

If the project is greater than $2.999 million per year or is greater than $499,999 per year and is a financial project, then the project is considered large.

If the project is greater than $249,999 per year, but doesn't meet the requirements of Section 4.2.5.1, then the project is considered medium.

If the project is greater than 30 days in duration or is greater than $49,999 per year, but doesn't meet the requirements of Section 4.2.5.2, then the project is small.

Once the project size is determined, the Project Manager can use the project matrix criteria in Table 4-2 in conjunction with the complexity model rating to determine the project requirements.

Table 4-2. Project Requirements Matrix

IT Projects	Definition	Definition Criteria	CPIC Requirements	Project Management Requirements
Project Large	Large unique project with start and finish dates	> $ 2,999,999 annual spend or > $ 499,999 annual spend and Financial System	CPIC required	Minimum: Preliminary Project Management Plan CPIC Required Approval from Information Investment Subcommittee (IIS) System Management Plan (for systems projects only) Most PM Processes **
Project Medium	Medium unique project with start and finish dates	< $ 500,000 annual spend > $ 249,999 annual spend	CPIC Lite required (May be incorporated into the Exhibit 300)	Minimum: Preliminary Project Management Plan CPIC Lite Required Approval from IIS System Management Plan (for systems projects only) Most PM Processes **
Project Small	Small unique project with start and finish dates	< $ 250,000 annual spend > $ 49,999 annual spend or > 30 days	Not Applicable	Minimum: Project Management Plan Project Schedule and Baseline Project Planning, Monitoring, & Reporting Document Management Others Likely to be Applicable: Requirements Management Change Control Quality Management Organizational Change Management Project Closure

** Project procedures that support processes include:

- Project Initiation and Planning
- Project Schedule and Cost Baseline
- Project Status, Forecasting, & Reporting
- Risk Management
- Issue Management
- Requirements Management
- Change Control
- Quality Management
- Procurement Management
- Organizational Change Management
- Document Management
- Project Closure
- Procedure Development

Note that the complexity model in Appendix F may be used to determine project process requirements per the considerations presented in Section 2.2.

4.2.6 *Prepare and Submit Required Documents*

The Project Manager prepares and submits the required documents identified in Table 4-2. Project Requirements Matrix based on the project size and complexity. References (Web site links) to the various documents are listed below.

4.2.6.1 Prepare Capital Planning and Investment Control (Required for Large Projects)

The following documents provide guidance on preparing CPIC:

- OMB Guidance for Completion of Exhibit 300
  http://www.whitehouse.gov/omb/circulars/a11/current_year/s300.pdf
- Information Technology Capital Planning and Investment Control (CPIC), Directive 2100.3
  http://intranet.epa.gov/oei/imitpolicy/qic/ciopolicy/2100.3.pdf
- EPA CPIC Procedures - OMB Budget Exhibit 300
  http://intranet.epa.gov/cpic/fy2008/cpic-procedures-sept05.pdf
- EPA draft Exhibit 300 CPIC Guidance, v.2
  http://intranet.epa.gov/cpic/
- Template for Capital Asset Plan and Business Case Summary Exhibit 300
  http://intranet.epa.gov/cpic/
- Template Instructions for Capital Asset Plan and Business Case Summary Exhibit 300
  http://intranet.epa.gov/cpic/

4.2.6.2 Obtain Information Investment Subcommittee Approval (Required for Large and Medium Projects)

The following documents provide guidance for obtaining IIS approval:

- Enterprise Architecture Policy, Directive 2120.3
  http://intranet.epa.gov/oei/imitpolicy/
- Agency Network Security Policy, Directive 2195.1A4
  http://intranet.epa.gov/oei/imitpolicy/

4.2.6.3 Prepare CPIC Lite (Required for Medium Projects)

The following documents provide guidance for preparing CPIC Lite:

- Implementing CPIC Lite - The Capital Planning and Investment Control (CPIC) Process for Non-Major Investments
  http://intranet.epa.gov/cpic/fy2006/cpiclite/
- Sample Memo - CPIC Lite Annual Certification
  http://intranet.epa.gov/cpic/fy2006/cpiclite/
- E-Gov Initiatives at a Glance
  http://intranet.epa.gov/cpic/
- E-Gov Initiatives and Lines of Business/Sub functions they Support
  http://intranet.epa.gov/cpic/fy2006/cpiclite/att-c2_cpiclite-e-gov-lob.pdf

- CPIC Lite Investment Proposal Form
  http://intranet.epa.gov/cpic/cpiclite/

It is important to note that projects that qualify for CPIC Lite may already be included in an existing business case. Review existing business cases if applicable.

4.2.6.4 Prepare SLCM Documentation (Required for System Projects)

The following documents provide OEI's requirements for designing and operating agency information systems, to include guidance for preparing the System Management Plan (SMP):

- System Life Cycle Management Policy, Directive 2100.5
  http://intranet.epa.gov/oei/imitpolicy/
- Interim Systems Life Cycle Management Procedure
  http://intranet.epa.gov/otop/policies/Extended_InterimProcedures.pdf

The Project Manager (referred to as the System Manager in OEI's policy) is responsible for tailoring the SLCM Policy to meet the needs of his/her project, according to the size of the project. An SMP must be developed for each system project. The SMP is updated throughout the life of the project and into maintenance of the resulting operational system as milestones or checkpoints are reached in accordance with OEI guidance. In this way, it is similar to the PMP referred to in this procedure. For OETI system projects, the SMP is prepared as well as the artifacts required as part of this project initiation and planning procedure. The additional artifacts are then incorporated into the SMP.

4.2.6.5 Develop High Level Work Breakdown Structure (WBS) and Project Schedule (Required for All Projects)

At this point, the Project Requestor creates a high-level schedule and WBS. The PMI defines a WBS as "a deliverable-oriented, hierarchical decomposition of the work to be executed by the project team, to accomplish the project objectives and create the required deliverables."[3] For the initial development of the WBS, the Project Manager uses the following inputs to develop a high-level WBS:

- Project objectives
- Major milestones and deliverables
- Functional experts and subject matter experts (SMEs)
- Lessons learned from previous and similar efforts

The WBS is different from the project schedule. The WBS shows what work needs to be accomplished but does not focus on how to do it, when it is scheduled to be done, and who will complete the work. This information is defined in the project schedule. A sample WBS is presented in Appendix G of *PMP-03 Project Schedule and Cost Baseline Procedure*. *PMP-03* gives additional information on the development of both the WBS and the project schedule in Section 4.2.1.

The project schedule needs to include the major milestones and deliverables identified thus far and the summary tasks and activities needed to complete the scope of work. In the activities performed as part of the *PMP-03 Project Schedule and Cost Baseline Procedure*, the summary schedule activities are broken down into discrete tasks.

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[3] Project Management Institute Project Management Body of Knowledge (PMBOK®), Third Edition, 2004. Chapter 5 – Project Scope Management, pg. 112.

The project planning template in Appendix E is used to capture initial schedule estimates and parameters. The detailed project schedule (including the integrated master schedule (IMS), work breakdown structure (WBS) and resource loading) are developed in accordance with *PMP-03 Project Schedule and Cost Baseline Procedure* after the project is approved. The Project Manager develops an initial project schedule during the planning phase of the project and continues to develop iterations of the schedule. The project schedule may be developed and refined in several stages as EPA staff and contractors are brought onboard and project requirements are understood.

4.2.7 *Project Approved? (Required for Large and Medium Projects)*

Once the Project Manager submits the documentation requirements, they are either approved and the project proceeds or disapproved and the project initiation and planning activities end. The levels of approval may vary based on the size, cost, and complexity of the project and the documentation required for external review and approval. The Project Manager should refer to the OCFO, OPM for appropriate project approval routing based on the size, cost, and complexity of the proposed project. For system projects, the Project Manager follows OEI's SLCM procedures for obtaining project approval. In addition, the Project Manager is required to obtain approval for moving between key phases of the project's system life cycle by submitting decision papers at these key milestones as defined in OEI's SLCM procedures.

As part of the project approval step for system and non-system projects, the project approver determines whether the project's complexity, size, and other characteristics warrant development of an independent IMS or whether the project schedule is grouped into an existing IMS. If the project is small or is similar to an existing project(s), the schedule may be included in an existing IMS with other projects with similar functions and/or objectives.

4.2.8 *Identify Applicable Plans and Processes*

Once the project receives final approval and funding, the Project Manager holds discussions to begin more detailed planning activities and determine the scope of processes to apply to the project. The Project Manager and any named Project Team Leads use the data generated thus far, including the rating from the Project Complexity Model, to determine project management requirements. Table 4-3 presents the triggers used to facilitate the analysis to 1) determine whether or not a procedure applies to the project and 2) the extent to which the procedure is implemented for the project. The data in each column are used to determine if the procedure is applicable. In addition, each procedure document provides specific factors for scaling the procedure (Section 2.2 Scalability).

Table 4-3. Procedure Scalability Guidelines

Procedure	Does the procedure apply?	Determining Procedure Scalability
OETI-PMP-01 Procedure Development Guide	▪ Applies if the project team identifies the need for a new procedure or a change to an existing procedure ▪ Large, complex, or unique projects are more likely to require new or revised procedures	▪ Not applicable
OETI-PMP-02 Project Planning Procedure	▪ Applies for all projects	▪ Procedure is scaled based on project size, cost, risk, internal/external requirements, uniqueness of effort, and the number of stakeholders ▪ The higher the Project Complexity Model rating the more detail necessary in the PMP (SMP for

Procedure	Does the procedure apply?	Determining Procedure Scalability
		system projects) ▪ For system projects, must complete documentation required by OEI SLCM Policy and procedures
OETI-PMP-03 Project Schedule and Cost Baseline Procedure	▪ Applies for all projects	▪ All projects should document basic schedule and cost information ▪ The detail required in the cost and schedule baselines is based on project size, cost, resources/contractors involved, and project duration ▪ If CPIC or CPIC Lite is required, earned value management data is captured
OETI-PMP-04 Project Status, Forecasting and Reporting Procedure	▪ Applies for all projects	▪ Procedure is scaled based on project size, cost, duration, number and type of stakeholders, participation of contractors, degree of project risk, and any internal and external reporting requirements ▪ Higher Project Complexity Model rating requires more rigor in statusing and reporting activities
OETI-PMP-05 Risk Management Procedure	▪ Applies for all projects	▪ Procedure is scaled based on project size, cost, duration, control over resources, use of new technology, number of stakeholders, and the potential business impact of the project ▪ Development of a project risk management plan is required for system projects ▪ Large, complex, or unique projects tend to face a greater number of risks and require more rigor in managing risks
OETI-PMP-06 Issue Management Procedure	▪ Applies for all projects	▪ Procedure is scaled based on project size, cost, duration, control over resources, use of new technology, number of stakeholders, and the potential business impact of the project ▪ Large, complex or unique projects tend to face a greater number of issues and require more rigor in tracking and managing issues
OETI-PMP-07 Requirements Management Procedure	▪ Applies if project is a system project ▪ Applies if a set of baseline requirements is defined where traceability is required	▪ Procedure is scaled based on the type of project, whether the project is new for the organization, the number and type of stakeholders, and whether or not the stakeholders are responsible for defining "what" the project should achieve
OETI-PMP-08 Change Control Procedure	▪ Applies if a project has a Project Complexity Model rating of "Medium" or "High" ▪ Applies if project is a system project or has defined set of baseline requirements	▪ Procedure is scaled based on number of interdependent activities, the likelihood for cost, schedule or resources changes and need to control them, changes and potential impact to project scope, the number of risks identified early in the project with potential to impact project scope, need more formal change control process

Procedure	Does the procedure apply?	Determining Procedure Scalability
		▪ Change Control Board needed for system project, less typical for non-system projects

OETI-PMP-09 Quality Management Procedure	▪ Applies to all projects	▪ All projects require at least basic quality assurance practices such as peer review of a deliverable
		▪ Development of a formal Quality Assurance Plan is required for projects with a Project Complexity Model rating of "High" and for system projects
		▪ Quality assurance activities are performed for projects that incorporate performance based contracts (as dictated in the contract)
		▪ More detailed quality assurance practices are required if:
		  ▪ There are significant risks associated with the project that require quality assurance as a mitigating action
		  ▪ The quality of the product plays a significant role in the success of the project
		  ▪ The project must meet internal or external quality standards

OETI-PMP-10 Procurement Management Procedure	▪ Applies if the project team will procure a product and/or service from a vendor in order to meet project objectives	▪ Procedure is scaled based on type of procurement, type of contract(s), the contract vehicle(s) used, and the direction of the Contracting Officer

OETI-PMP-11 Organizational Change Management Procedure	▪ Applies if a project has a Project Complexity Model rating of "High"
	▪ For all other ratings, components of the procedure may be adopted and scaled as necessary to achieve project objectives
	▪ Some application of the communication component is required for all projects
		▪ Procedure is scaled based on project size, number and type of stakeholders, Project Complexity Rating, the type and degree of business change, the degree to which job roles and/or responsibilities change, and the type of communications required (both internal and external)
		▪ Components of the procedure may apply and are scaled accordingly if:
		  ▪ There is change to the way a team or office performs its functions (Business Process Reengineering (BPR), Workforce Analysis, Training)
		  ▪ New capabilities (typically automation) are being introduced to a team or office (Workforce Analysis, Training)
		  ▪ The initiative affects customers (Training)
		  ▪ Job roles and responsibilities are impacted (Workforce Analysis)

OETI-PMP-12 Document Management Procedure	▪ Applies for all projects	▪ At a minimum, project artifacts and contract deliverables should be named and stored in accordance with standard document naming and storage requirements defined for OETI
OETI-PMP-13	▪ Applies for all projects	▪ Procedure is scaled based on size, complexity,

Procedure	Does the procedure apply?	Determining Procedure Scalability
Project Closure Procedure		scope, number of deliverables, and existence of a contract(s)

Regardless of the size, scope and complexity of the project, the Project Manager and Project Team Leads should give careful consideration to the unique characteristics and requirements of the project to determine which processes are applied. Once processes are identified and scaled for the project, the Project Manager may assign the detailed planning activities and development of the subsidiary project plans to resources selected to lead the efforts.

4.2.9 *Identify Resource Requirements*

High-level resource requirements are likely to have been identified during the initiation and high level planning activities as a result of cost and scope estimating and initial analysis. At this point, if resource requirements cannot be met with resources available within the organization, the Project Requestor and/or Project Manager may initiate a procurement action to get the services and/or products needed to complete the project. Specific guidance on pre-award and award activities is provided in *PMP-10 Procurement Management Procedure*.

If resources are available in-house, the Project Requestor and senior management begin assigning available individuals to appropriate open roles that have been identified for the project.

4.2.10 *Perform Detailed Planning*

As directed by the Project Manager, the project management team begins to define and refine the details regarding execution of the project. For processes that are determined to be applicable to the project, separate teams with content specific expertise (such as organizational change management) may perform the detailed planning and documentation of the applicable plan. Activities that may take place during detailed planning include:

- Refining the project scope
- Defining the extent to which certain project processes will be performed
- Identifying type and source of resources required
- Continuing planning efforts for any necessary procurement actions
- Defining more specific project milestones and critical dates
- Defining specific project risks
- Defining applicable performance measurements and means for measuring project performance
- Documenting detailed cost data/estimates
- Documenting project assumptions (including standards, constraints and other project requirements, internal and external)
- Beginning planning for other applicable project processes – quality, organizational change management, change control, etc.

The outcomes of the detailed planning activities serve as the foundation for the project and identify the who, what, and how for execution of the project. This information is captured in the Project Management Plan and is continually refined over the life of the project as new activities, constraints and project variables are introduced.

4.2.11 *Develop Project Management Plan*

The Project Management Plan is the core document for project planning and management and reflects all key details and decisions for the project. The Project Management Plan contains the results of the detailed planning activities and is developed by the Project Manager or assigned by the Project Manager to Project Team Leads. The Project Management Plan captures these decisions and also serves as the "parent" document for any other process-specific plans developed for the project. As the users identify the need for implementation of an additional project management process for the project, they update the Project Management Plan to reflect the addition and add a placeholder to the Plan's appendices to add the subsidiary plan upon its completion. These subsidiary plans are typically identified during initiation and planning but can be added at anytime during the project life cycle as project requirements change.

The Project Management Plan is a living document and its users update it continually to reflect changes to the project. Changes are likely to occur as re-planning and re-baselining activities occur during project execution. More information on the factors that drive re-planning and re-baselining activities is provided in *PMP-03 Project Schedule and Cost Baseline* and *PMP-04 Project Status, Forecasting and Reporting*. The extent of the re-planning effort determines the scope of required Project Management Plan updates and updates to the subsidiary project plans.

As described in Section 4.2.6.4, for system projects, OEI's SLCM Policy requires preparation of an SMP, which is similar to the PMP. In this case, the PMP is titled SMP and OEI policy and procedures guide its development. Any additional requirements outlined in this procedure are prepared in addition to the SMP and may be incorporated in that plan.

4.2.12 *Update Plans*

As the project moves from the planning phase to execution, it is likely that changes may occur that affect the project's processes and the data documented in the Project Management Plan as well as the subsidiary plans. Changes can rise from approved change requests, as well as result from the re-planning process, external factors, or significant events within the organization. The Project Manager is responsible for determining who will be responsible for making the updates to the Project Management Plan as well as any subsidiary plans. The Project Manager reviews and approves all updates and changes to the Project Management Plan and any subsidiary plans

5. Considerations

The following provides a list of general best practices that should be considered when conducting project initiation and planning activities:

Project Initiation and Planning

- Project initiation and planning activities can be very general or very detailed. If the project has been completed many times before by the organization or is very small, general planning and reuse of plans may be sufficient. Large, complex or novel projects typically require more detailed planning and documentation.
- The Project Manager, in collaboration with the project team, is always responsible for determining what processes are appropriate, and the appropriate degree of rigor for each process for any given project.[4]
- Planning activities should include stakeholders where relevant and feasible.
- Planning for different process areas can occur simultaneously (e.g., risk and quality)
- Critical to the planning process and development of the Project Management Plan is the analysis and understanding of the scope of the project by the planning team.

The Project Management Plan (PMP)

- The PMP should be reviewed and approved by the Project Manager each time significant changes occur on the project
- The PMP should be reviewed and updated periodically to keep the document up-to-date. It should be available at any time for internal or external use and for orientation of new project members.
- The PMP should be robust enough that a new reader can get a clear understanding of the project from reading it.
- The template for the Project Management Plan (located in Appendix E) can be expanded to include any sections or material that the project team feels is relevant for project management and execution. Additional template samples can be accessed via the links found in Appendix C.
- Version control per *PMP-12 Document Management Procedure* is essential for maintaining and updating all project plans; updates to the Project Management Plan and all subsidiary plans should be completed by designated individuals only.

Cost Estimating

- Think about the variables of the project before creating the cost model
  - Identify what variables will change across alternatives and build your model to those variables
  - Create a solid Cost Element Structure that is as flexible as possible given the alternatives and that addresses the “slicing and dicing” needs for the data
- Ask an experienced modeler or estimator to review the model

[4] Project Management Institute Project Management Body of Knowledge (PMBOK®), Third Edition, 2004. Chapter 3 – Project Management Processes for a Project, pg. 37.

  - Make sure that the review covers functionality and the meaning behind the numbers
  - Ask if the assumptions are reasonable and if the risk reserve is reasonable
- Be careful when giving preliminary numbers
  - Numbers stick in people's heads
  - Be reasonably sure of the accuracy of the figures provided

Appendix A. Acronyms

The following acronyms are referenced in this document.

Abbreviation	Description
BPR	Business Process Reengineering
CMMI	Capability Maturity Model Integration
COTS	Commercial Off-the-Shelf
CPIC	Capital Planning and Investment Control
DAU	Defense Acquisition University
DoD	Department of Defense
EAC	Estimate at Completion
EPA	Environmental Protection Agency
EVM	Earned Value Management
FTE	Full Time Equivalent
GAO	Government Accountability Office
IBR	Integrated Baseline Review
ICE	Independent Cost Estimate
IGCE	Independent Government Cost Estimate
IIS	Information Investment Subcommittee
IMS	Integrated Master Schedule
LCC	Life Cycle Cost
NASA	National Aeronautics and Space Administration
OMB	Office of Management and Budget
OCFO	Office of the Chief Financial Officer
OEI	Office of Environmental Information
OETI	Office of Enterprise Technology and Innovation
OMB	Office of Management and Budget
OPM	Office of Program Management
PM	Project Management
PMB	Performance Measurement Baseline
PMBOK®	Project Management Body of Knowledge
PMI	Project Management Institute
PMP	Project Management Plan
ROM	Rough Order of Magnitude
SEI	Software Engineering Institute
SLCM	System Life Cycle Management
SME	Subject Matter Expert
SMP	System Management Plan
WBS	Work Breakdown Structure

Appendix B. Checklist for Project Initiation and Planning Activities

The following table provides a checklist for the key activities associated with each step of this project initiation and planning procedure.

Activities	Responsible Parties
4.2.1 Complete Project Complexity Model	
☐ Basic project variables relative to estimated cost, time, and complexity understood	Project Requestor
☐ Project Complexity Model completed and model rating received and perceived as reasonable	Project Requestor
☐ Additional analysis performed (as required) to better understand or mitigate areas of significant uncertainty	Project Requestor
4.2.2 Prepare Rough Estimate of Size, Cost, and Time	
☐ Rough order of magnitude (ROM) cost estimate completed using experience or actuals from similar efforts	Project Requestor
☐ Approximate number of resources required to complete effort is documented	Project Requestor
☐ Approximate amount of time needed to complete effort defined and documented (in months)	Project Requestor
☐ Supporting documentation for project known/defined (business need, goals and objectives, initial business case, cost/benefit, as applicable	Project Requestor
4.2.4 Revise Estimate of Size, Cost, and Time	
☐ Approval to proceed with project obtained	Project Requestor/Project Manager
☐ The Project Manager assigned	Project Sponsor
☐ Enough information obtained to refine estimate ☐ Cost estimating tool selected and available, if needed ☐ Method for estimating defined ☐ Assumptions for estimate documented ☐ Resources or estimates from similar efforts consulted ☐ Vendor estimates submitted, if applicable ☐ Estimate reviewed and approved	Project Manager/Estimator
4.2.5 Determine Project Requirements	
☐ Project resource requirements reviewed relative to available resources	Project Manager
☐ A decision made as to whether outside products or services are needed to execute the project	Project Manager
☐ Available resources assigned to open roles based on skill matches	Project Manager
☐ If applicable, a procurement action initiated to procure the desired product or services	Project Manager
4.2.6 Prepare and Submit Required Documents	
☐ For large, complex projects – CPIC completed	Project Manager
☐ For medium projects – CPIC Lite completed	Project Manager

Activities	Responsible Parties
□ For large and medium projects, documentation prepared for approval by the Investment Subcommittee	Project Manager
□ For large and medium system projects, OEI SLCM documentation completed	Project Manager
□ For all projects, an initial project schedule completed	Project Manager
4.2.8 Identify Applicable Plans and Processes	
□ Final project approval received	Project Manager
□ Project documentation and unique project requirements evaluated to determine which processes should be implemented for the project, and to what extent	Project Manager/Planning Team
□ Decisions documented for incorporation into the PMP (SMP for systems projects)	Project Manager/ Planning Team
4.2.9 Identify Resource Requirements	
□ Available resources within the organization known and evaluated to determine "fit" to open project roles	Project Manager/Planning Team
□ Need to procure outside resources to fulfill project requirements evaluated	Project Manager/Planning Team
□ If applicable, procurement process initiated per *PMP-10 Procurement Management Procedure*	Project Manager/Planning Team
4.2.10 Perform Detailed Planning	
Detailed planning activities occur for the project where the team defines the "how" for project execution	Project Manager/Project Team Leads
4.2.11 Develop Project Management Plan	
□ Responsibility for development of the PMP (SMP for a system project) assigned by the Project Manager	Project Manager
□ Project planning decisions documented in the PMP (SMP for a system project)	Project Manager/Project Team Leads
□ Development of subsidiary project plans assigned as resources become available	Project Manager
□ PMP (SMP for a system project) viewed and approved	Project Manager/Project Sponsor (as required)
4.2.12 Update Plans	
□ Process and responsibility for updating the PMP (SMP for a system project) and all subsidiary plans defined	Project Manager
□ Plans continually updated to reflect changes and addition to the project as they occur over the life of the project	Project Manager/Project Team Leads
□ Test, inspection, and acceptance performed in accordance with contract and framework established above (if required under the contract)	DO/TO/WA COR or Contract-Level COR

Appendix C. Additional Resources

The following table provides key resources and references associated with the project initiation and planning procedure that can be used to assist in completion of the activities.

	Form/ Guidance	Source	Website
1.	Project Management Framework	State of Washington	http://isb.wa.gov/tools/pmframework/
2.	Project Management Templates and Guidance	Commonwealth of Virginia	http://www.vita.virginia.gov/projects/cpm/templates.cfm
3.	Sample Project Management Plans and Templates	U.S. Department of Energy	http://cio.doe.gov/ITReform/sqse/publications.htm
4.	Project Planning Guidebook	State of New York	http://www.oft.state.ny.us/pmmp/guidebook2/Planning.pdf
5.	Guidance on cost estimating	National Aeronautics and Space Administration	http://www1.jsc.nasa.gov/bu2/guidelines.html http://www1.jsc.nasa.gov/bu2/PCEHHTML/pceh.htm
6.	Capability Maturity Model Integration (CMMI)	Software Engineering Institute (SEI) – Carnegie Mellon University	http://www.sei.cmu.edu/cmmi/adoption/pdf/byrnes.pdf
7.	Project scheduling definitions and related concepts	University of Washington	http://www.washington.edu/computing/pm/plan/schedule.html

Appendix D. Cost Estimating Guidelines

The purpose of this appendix is to provide additional background information and guidelines for developing a cost estimate. High-level guidelines are provided in addition to more detailed federal guidance extracted from OMB Circular No. A-11 (2006).

Basic Guidelines

- Cost estimation is an entire discipline of itself, however, most of the estimating done is based simply on common sense, organization, and understanding of the project
- There are multiple techniques for cost estimating
  - Parametric – uses historical relationships of cost to cost drivers to extrapolate estimates
  - Engineering Build Up – technical team that would be performing the work estimates costs at the lowest level of detail (i.e., at the task level)
  - Analogous – uses comparison to similar items or efforts and extrapolates factors to adjust upwards or downwards based on differences in complexity or size
  - Vendor quotes/Rough Order of Magnitude (ROM) estimates
- Work with the technical team to determine the appropriate methodology and approach for each cost element based on:
  - Availability/reliability of appropriate data
  - Sensitivity to technical and programmatic specifics
- The technical team should provide resource estimates and assumptions and help in determining complexity factors
  - The estimator's job is to draw this information out of the team, ensure that it makes sense, and cost it out
    - Ask questions – you may not be a technical expert for the item being estimated

Documentation of Assumptions and Estimates

- Often overlooked or completed as an afterthought, but necessary:
  - Maintain transparency in the modeling process
  - Answer questions before they are asked
  - Allow for efficient auditing, QA, and updating - Anyone who looks through your model and documentation should be able to understand why the numbers are what they are and where they came from
- Provide a clear, detailed description of estimates
  - Source: Where or who they came from
  - Methodology: How they were developed
    - Rationale: What the basis or reasoning is behind any assumptions (quantity, time-phasing, allocation among cost elements)

COST ESTIMATING (From OMB Circular No. A–11 (2006) Page 93 of Capital Programming Guide) APPENDIX 9 CAPITAL PROGRAMMING GUIDE (Pages 691-695)

Introduction

Credible cost estimates are vital for sound management decision making and for any program/capital project to succeed. Early emphasis on cost-estimating during the planning phase is critical to successful life cycle management of a program/project. As requirements and approaches vary based on the Agency's mission, agencies have to develop a cost estimating capability—collecting, managing and sharing cost data that best meets their mission needs. This Appendix is based on the Government Accountability Office's (GAO) guide to their auditors on how to evaluate an Agency's cost estimating process, and the reliability and validity of the data used to develop the cost estimates. Following these guidelines will help agencies to meet most cost estimating requirements. Individual cost estimating guides are also available from, or are in use by, several government agencies including several Department of Defense (DoD) Service branches, the National Aeronautics and Space Administration (NASA), and the Department of Energy.

Cost Estimating and its Role in Managing Capital Assets

A disciplined Cost Estimating process provides greater information management support, more accurate and timely cost estimates, and improved risk assessments that will help to increase the credibility of capital programming cost estimates. Cost Estimation touches on various disciplines such as accounting, economics, management science, engineering, statistics, probability, etc. Combining these disciplines and using them effectively produces sound cost estimates which can be used in preparing annual budgets, in developing net present value or other return on investment estimates, in improving life cycle management of various capital assets with more reliable performance baselines and earned value management), evaluation of alternatives through cost-benefit analysis, risk assessment and so forth.

Types of Government Cost Estimates

Capital cost estimating attempts to predict future capital expenditures even though not all factors and conditions of the investment are fully defined. There are many different types of cost estimates that Agencies develop for various purposes and at different phases of the life cycle. For each type of estimate, bases (ground rules) and assumptions are spelled out. Some key challenges in performing the estimates are: that insufficient data is available; the program scope is not fully defined; the availability of resources is not definitive; and that risks are not fully determined.

The following are types of cost estimates used in the program life-cycle:

- **Conceptual Cost Estimate:** This is used early in the Planning Phase of the acquisition life cycle and is often based on a one-to-one comparison with an existing system similar to the system being proposed .
- **Preliminary Cost Estimates:** This is used as more details are available and for preparing budgets.
- **Detailed or Engineering Cost Estimates:** This is a bottoms-up estimate using the detailed WBS structure to price out discrete components, such as material, design hours, labor, off the shelf software, etc.;
- **Definitive Cost Estimate:** This is used late in the acquisition life cycle during the Project Control Phase, based on actual cost data, available from the same system at an earlier time. The Earned Value Management concept is used to arrive at the Estimate at Completion (EAC).

- **Life Cycle Cost (LCC) Estimate:** This estimate provides the total cost to the Government of acquisition and ownership of the system over its full life time. It includes the cost of development, acquisition, support, and (where applicable) disposal.
- **Independent Cost Estimate (ICE):** This estimate is based on the same scope as the LCC, except that it is prepared by an independent review team using independent data sources and cost estimating approaches.
- **Independent Government Cost Estimate (IGCE):** This estimate is prepared for evaluating and validating contractor proposals presented during the Acquisition Phase. This is prepared from the offeror's point of view and is based on the scope of work outlined in the solicitation.

Techniques of Cost Estimating

Many techniques can be used for cost estimating, from simple arithmetical calculations, to complex mathematical models with numerous variables. Some of the techniques (as defined by the DoD Defense Acquisition University (DAU)) are:

- **Analogy:** Used early in the acquisition life cycle based on a one-to-one comparison with an existing system similar to the system you are designing;
- **Parametric:** Uses statistical analysis from a number of similar systems and their relationship to your system;
- **Engineering:** A bottom-up estimate using the detailed WBS to price out discrete components, such as material, design hours, labor, etc.;
- **Extrapolation-from-actual-costs:** Method used late in the acquisition life cycle after actual cost data are available from the same system at an earlier time.

Cost Estimating Methodology

To keep the estimate current, accurate and valid, the cost estimating process is continuously updated, based on the latest information available. As the project matures the availability of valid data increases. The major steps in the cost estimating process are as follows:

- Based on preliminary project scope, prepare a high level WBS—generally three levels deep.
- Define the Ground Rules and Assumptions including technical, economic, schedule, business and other factors. These assumptions need to be realistic, and continuously reviewed and updated, as the scope of the project becomes better defined with the passage of time.
- Develop Data: Collect, identify and analyze data for the cost estimate. Data (accurate, relevant, and correct confidence level) is the most important piece of the cost estimate, is time consuming to prepare properly, and includes cost drivers for the cost estimate and risk. Agencies need to develop the capability to collect, identify, and analyze data from various sources such as previous in-house projects, outside parties (professional organizations, vendors and others engaged in the industry), various procurement/contract data, project management data, accounting/financial management systems and other sources. Most data is in raw form and must be normalized using learning curves and other methods, so that they are comparable and consistent. The normalized data is then adjusted to make them useable for the specific project. All data, including any adjustments made, should be thoroughly documented so an audit trail is established for verification purposes.
- Select/Construct Cost Model: Select the most appropriate tool/model or create a model to estimate the cost. Document factors that influence the selection process such as data and resource availability, schedule and cost.

- Develop the Estimate: Based on the Ground Rules and Assumptions, and using the normalized/adjusted data, develop the cost estimate and the level of confidence using the various risk factors,
- Perform the sensitivity analysis: Once the estimate is developed, decision makers want and need to know how sensitive the total cost estimate is to changes in the data input. Therefore, a sensitivity analyses is performed to identify the major cost drivers for the estimate. Sensitivity analyses determine how the different ranges of estimates affect the estimates. Cost drivers are those variables that when changed in value, create the greatest changes in cost. Generally many initial assumptions made in the early phases of a project's definition will, in later phases, be found to be inaccurate.
- Develop Contingency Reserve: Based on the confidence level, a contingency allowance is used to cover the items of cost which are not known exactly at the time of the estimate. A Preliminary Estimate generally has a confidence level of 70 percent while a Definitive Estimate will have a confidence level of 90 percent. Contingency allowances of 30 percent and 10 percent respectively, would be added to the preliminary estimate and definitive estimate respectively.
- Document Cost Estimate: Explain the cost estimating process used, and document how the cost estimates were prepared so that the quality of the estimate could be determined.
- Perform a peer review: Proper documentation will increase the credibility and facilitate information sharing, and make these estimates usable in the future.
- Update Cost Estimate: On a regular basis keep the cost estimates current. Such quality data is needed for decision making using "what if" models and to project the impact of alternative decisions.

Application of Cost Estimating

- Capital budget estimates: Using these estimating techniques and processes, Agencies can develop more reliable, and accurate capital budget estimates for funding acquisition programs with realistic schedules. This may be submitted to OMB through Exhibit 300 during the Agency budget submittal cycle.
- Cost and benefit studies: Through cost and benefit studies, Agencies can determine the best investments meeting the Agency mission, goals and objectives.
- Life Cycle Cost: The project's Life Cycle Cost helps management to make the right decision.
- Project Management: Determines the project's PMB and identify risks which are managed through the EVM technique and through pre-award/or post-award IBRs.
- Risk Analysis: Cost estimates at various stages of the program identify the nature of the risk and its impact on the program. As the program matures, the uncertainties are reduced as the design and development processes are known. Therefore through the use of EVM, risks are managed. Management reserves are defined for the use by the Program Manager

Conclusion:

Understanding the type of estimating technique is important for providing a useful estimate to the decision makers. Cost estimates are key elements of a project plan, so project personnel expend considerable effort preparing them. They provide the basis for assessing the total requirement and the recommended phasing of budgets. Obtaining accurate cost estimates can be difficult for complex projects which involve new technologies and require extensive time to complete. While managers sometimes feel pressured to provide optimistic estimates in order to obtain project go-ahead

approval, a poor cost estimate can create an un-executable plan. A project with an inaccurate cost estimate undermines the process for developing an optimal portfolio of capital projects and when the funding shortage becomes apparent, may lead to significant de-scoping or termination of the project.

References:
GAO Cost Estimating Guide for Government Auditors (Draft—2005)
DOD/DAU—Integrated Defense Acquisition, Technology and Logistics Life Cycle Management Framework

NOTE: Additional references are provided in Appendix C

Appendix E. Sample Project Planning Template

Project Management Plan

General Information

Provide basic information about the project including: Project Title – The Project Sponsor - The Office that will be responsible for the management of the project; Prepared by – The person(s) preparing this document; Date – The date the plan is prepared.

Project Title: _____

Sponsor: _____ Project Managed by: _____

Prepared by: _____ Date: _____

Points of Contact

List the principal individuals who may be contacted for information regarding the project.

Position	Title/Name/Organization	Phone	E-mail
Project Sponsor			
Project Manager			
Procurement Contact			
Stakeholders			
Other			

Project Resources External to OETI

List the resources external to OETI that will be needed to plan and execute the project. This list should include contractors, if applicable.

Description of Resource needed	Supporting Organization	Estimate of Resources needed	Contact Point for Resources
1.			
2.			
3.			
4.			
5.			

Project Plan Summary

1 - Business Problem

Describe the issue, question or problem that is addressed by this project. Provide the facts or justification that support the need for the project and list the key high level business objectives that the project will fulfill. The description of the business problem should be concise and brief regardless of the size and complexity of the project.

2 - Assumptions

List the assumptions made about the project. Assumptions are basic statements that are known to be true and have relevance or an impact on the project. Constraints, which are defined as limitations and are often outside of the project team's control, should also be listed in this section. Assumptions

can be related to resources, budget/costs, time and technology, as standard examples. Typically, larger and more complex projects have more known assumptions. However, all known current assumptions should be documented for every project and updated as conditions change.

3 - Project Description

Provide the full detailed description of the project including the following items: specific business objectives, how the objectives of the project tie to the strategic initiatives of the organization and additional details related to schedule, resources, technology and costs and other relevant components. This section tends to be longer for larger and more complex projects but is required for all projects.

4 - Project Scope

The Project Scope defines the extent of the products and services that will be developed as part of the project. The Project Scope should be as specific as possible and define the groups that will be impacted by the project within the organization. The Project Scope defined here must be consistent with the Project Charter, if applicable. All projects should have a defined project scope.

5 - Performance Plan Summary

Provide a summary of the Measures that will be used to evaluate the success of the project. In the table below, list the Project Objectives, Performance Goal for each objective, and briefly describe the Methodology for how the Performance Goal is measured. The larger and more complex the project, the greater number of performance metrics needed to measure and evaluate performance.

Project Objective	Performance Goal	Methodology

6 - Critical Milestone Summary

Summarize the Project Schedule by listing the Milestones or Events on the critical path of the Project Schedule. The critical path is: a series of activities, which determine the earliest completion time of

the Project. For each event, provide the Projected Date of completion and a brief description of the Significance of the Milestone or Event listed. Larger projects will have a more extensive milestone list while small projects may have as few as one.

Milestone or Event	Projected Date of Completion	Significance

7 - Budget Planning Summary

Provide a summary in table form of the expenditures and source of funding for the project during the life of the project. This budget does not include expenditures and funding for the life of the asset produced. Define the cost estimating methodology and/or models used to develop the estimate. The following table provides a sample Cost Element Structure.

NOTE: The **Explanation** provided for the estimate must be in detail. The source and basis for the cost estimate (model-based, expert judgment or use of an analogous estimate) must be cited specifically as well as major assumptions and constraints. For example, if a model is used, name the model; if an expert is used, identify the individual and if an analogous estimate is used, provide the name of the project or activity.

Planned Expenditure *($000)*						
	*FY 200_*	*FY 200_*	*FY 200_*	*FY 200_*	*Total*	*Comments*
1.0 Planning						
1.1 Planning *1.1.1 Program Mgmt* *1.1.2 Enterprise Architecture Design* *1.1.3 Project Management Plan Development* *1.1.4 Requirements Definition* *1.2 Facilities*						
2.0 Acquisition						
2.1 Acquisition Costs *2.2 Procurement* *2.2.1 Hardware* *2.2.2 Software*						
3.0 Implementation						
3.1 Implementation Support *3.1.1 Program Mgt.* *3.1.2 Business Process Reengineering (BPR)*						

3.1.3 Interfaces *3.1.4.System Design* *3.1.5 Build & Test* *3.1.6 System Integration Test & Evaluation* *3.1.7 Data Conversion* *3.1.8 Change Management* *3.2 Training* *3.3 Rollout*						
4.0 Maintenance and Operations						
*4.1 Hardware ** *4.2 Software** *4.3 O&M Support* *4.3.1 Data Center* *4.3.2 Applications Maintenance* *4.3.3 Enhancements* *4.4 Recurring Training* *4.5 Other Operations & Maintenance*						
Total						

* Includes all costs identified to support Operations and Maintenance activities including replacement, licensing, upgrades and maintenance.

Explanation:

NOTE: The Explanation provided for this estimate must be in detail (more than a few lines). The source and basis for the cost estimate (model-based, expert judgment or use of an analogous estimate) must be cited specifically as well as major assumptions and constraints. For example, if a model is used, name the model; if an expert is used, identify the individual and if an analogous estimate is used, provide the name of the project or activity.

8 - Procurement Plan Summary (If applicable for the project)

If procurements are required to fulfill the objectives of the project, summarize the Procurement Plan for the project. Include information about major Procurements, procurement strategies, and projected dates for critical procurement activities.

9 - Risk Plan Summary

Summarize the Risk Management Strategy for the project. Include the basic approach for identifying, monitoring and controlling risks over the life of the project. For larger projects and those with medium to high complexity ratings, a more detailed extensive risk strategy is likely to be required.

10 - Top Risk(s)

Provide a list of the highest risks to the project's success, including the probability of their occurrence, level of impact anticipated, and a brief description of the Mitigation Strategy for each. Risks identified during completion of the Project Complexity Model and other planning activities should be included here.

#	Description	Probability %	Impact 1= low 3=medium 5=high	Mitigation Strategy
1				
2				
3				
4				
5				
6				

7				
8				
9				
10				

11 – Append Additional Plans and Procedures

Appendix F. Project Complexity Model Template

This template provides a list of questions for each of the categories in the Project Complexity Model. In addition to the questions, the possible answers and the corresponding score are provided. At the end of each category, a maximum score and percentage are identified. The maximum score correlates to the highest complexity and risk possible for that category. The associated percentage shows the highest possible percentage impact the score for a category can have on an overall score. For example, if the highest scores are received for each question within the Cost category, the Cost score makes up to 33% of the overall score total, if the highest scores are received on all the questions within all other categories. This percentage simply reflects the relative weight of the category to the overall score. The higher the weight, the higher the possible risk to the project. The score ranges and the correlating rating assigned by the model are as follows:

Score Range	Project Complexity Model Rating
0 - 124	"Low" Complexity Rating
125 - 210	"Medium" Complexity Rating
211 - 427	"High" Complexity Rating

This information can be used to understand the basis for the rating or score received after completing the Project Complexity Model per Section 4.2.1.

Note: The Project Complexity Model and instructions for completing the model can be found on the OCFO website under Policies and Documents.

Category	Question #	Question	Answer Choices	Answer Scores
Cost	1	What is the total project cost?		
			Less than $50,000	0
			Between $50,000 and $250,000	10
			Between $250,000 and $500,000	20
			Between $500,000 and $3,000,000	30
			Greater than $3 Million	50

Category	Question #	Question	Answer Choices	Answer Scores
Cost	2	Which statement best describes the status of contractor funds for the project?		
			All funds needed are available for obligation	0
			All funds needed have been appropriated by Congress but are not allocated in the operating plan	10
			All funds needed have been approved by the Agency and OMB and have been requested from Congress	20
			Funding for the project has not yet been approved by the Agency and/or OMB	40
Cost	3	What is the estimated cost of application development or software configuration services?		
			N/A or $0	0
			Less than $100,000	2
			Between $100,000 and $500,000	4
			Between $500,000 and $1,000,000	6
			Greater than $1 Million	8
Cost	4	How much confidence is there in the expenditure and funding projections?		
			Accuracy of budget estimate is greater than 95%	2
			Accuracy of budget estimate is greater than 80% and less than or equal to 95%.	4
			Accuracy of budget estimate is greater than 50% and less than or equal to 80%	8
			Accuracy of budget estimate is less than or equal to 50%.	24
Cost	5	What percentage of the OETI budget does the project represent?		

Category	Question #	Question	Answer Choices	Answer Scores
			Project is less than 10% of the OETI budget	2
			Project is greater than or equal to 10% but less than 20% of the OETI budget	4
			Project is greater than or equal to 20% and less than 50% of the OETI budget	6
			Project is 50% or more of the OETI budget	12
Cost	6	Is funding available for maintenance of the project deliverable after project closure?		
			Maintenance funding is available	0
			Maintenance funding is planned and assured	2
			Maintenance funding is planned but not assured	5
			Maintenance funding has not been planned	10
Maximum Cost Total				144 (33%)
Staffing	7	Is the project sponsor fully resourcing the project?		
			Sponsor will provide all the resources needed	2
			Sponsor will provide most of the resources needed	4
			Sponsor has control of most of the resources needed	6
			Sponsor has control of some of the resources needed	12
Staffing	8	What is the size of the Project Team under control of the Project Manager (Full Time Equivalents)?		
			Less than one FTE	2
			1 to 3 FTEs	3
			3 to 5 FTEs	6
			5 or more FTEs	12
Staffing	9	What is the Project Manager's Authority over the project?		
			High to Total	2

Category	Question #	Question	Answer Choices	Answer Scores
			Moderate	4
			Limited to Low	8
			Little to None	16
Staffing	10	To what degree are the project team members co-located?		
			90%-100% of the team in the same location	1
			50%-90% of team in same location	2
			25% - 50% of team in same location	4
			25% or less of team in same location	6
Maximum Staffing Total				46 (11%)
Schedule	11	What is the project's duration?		
			Duration is less than 6 months	2
			Duration is 6 to 12 months	4
			Duration is 12 to 24 months	8
			Duration is greater than 24 months	16
Schedule	12	Is the project dependent on another project's deliverable		
			No other deliverables are required	0
			Other deliverables enhanced the project	5
			The project will utilize other project deliverables	10
			A project deliverable from another project is required	15
Schedule	13	How much variation in the timeframe can be tolerated?		
			Schedule is not fixed and therefore highly flexible	3
			Schedule can tolerate major variations	6
			Schedule can tolerate minor variations	9
			Schedule is fixed and can not be changed	12
Schedule	14	Are there any dependencies and/or inter-related projects?		
			There are no major dependencies or inter-related projects	0

Category	Question #	Question	Answer Choices	Answer Scores
			There are some dependencies and/or inter-related projects, but considered low risk	6
			There are some major dependencies and/or inter-related projects, that create a moderate level of risk	9
			There are significant dependencies and/or inter-related projects that place the project at a high level of risk	12
Maximum Schedule Total				55 (13%)
Customer Impact	15	How will the failure of the project impact the End Users?		
			There is no impact of project failure on the End Users	0
			Impact of project failure on End Users is minimal	4
			Impact of project failure on End Users is moderate	8
			Impact of project failure on End Users is high	16
Customer Impact	16	What is the anticipated involvement of the End Users with System Design and Testing?		
			There is no system design and testing	0
			Highly involved with development team, provide significant input and have significant ownership of system	4
			Play minor roles with development team or have moderate involvement on system development and testing	6
			Minimal or no user involvement with development team or little user input into process	12
Customer Impact	17	What is the status of the definition of Project Requirements and Scope		
			Requirements well-established, baseline defined, user involvement is high	2
			Requirements well-established, baseline defined, user involvement high to medium, and few changes anticipated	4

Category	Question #	Question	Answer Choices	Answer Scores
			Requirements defined but changes to baseline expected; requirements may not have been distributed to all end users	8
			Rapidly changing size or scope; requirements not defined and not signed off by users	16
Maximum Customer Impact Total				44 (10%)
Business Impact	18	How significant is the impact of this project to the mission of the OCFO?		
			The project is/has little or no direct impact on the OCFO mission	2
			The project is important to the OCFO core business activities and mission	4
			The project is critical to the EPA OCFO core business activities and mission	8
			The project is critical to the EPA OCFO core business activities and mission	16
Business Impact	19	How significant will the business process or activities be impacted?		
			No business process is impacted	0
			No critical processes are impacted	4
			Critical business processes are impacted	8
			A large portion of the business processes are impacted	16
Business Impact	20	What is the level of change to the business unit?		
			Impacts a single business unit	2
			Impacts a number of business units	4
			Impacts the whole OCFO	6
			Impacts the whole Agency	12
Business	21	Does the project address		

Category	Question #	Question	Answer Choices	Answer Scores
Impact		Federal mandates?		
			The project has little or no direct impact on accomplishment of Federal mandates	2
			The project enhances accomplishment of Federal mandates	4
			The project is important to the accomplishment of Federal mandates	8
			The project is critical to accomplishment of Federal mandates	12
Maximum Business Impact Total				56 (13%)
Technology	22	Is the proposed solution applied in a New, Proven, or Tried way?		
			Application of the technology is tried and proven	3
			An application of the technology has been tried and is partially proven	6
			A new application of the technology has been tried but is not proven	9
			A new application of the technology has never been tried before	12
Technology	23	Does this project require data conversion?		
			No data conversion is required	0
			Data conversion from other sources has little impact	4
			Data conversion from other sources has some impact	6
			Data conversion from other sources has a significant impact	8
Technology	24	Has the EPA and/or vendor executed similar projects?		
			EPA and vendor have executed many similar projects	2
			EPA or vendor have executed several similar projects	4
			EPA or vendor have executed a similar project	8

Category	Question #	Question	Answer Choices	Answer Scores
			Neither the EPA nor the vendor has executed a similar project	12
Maximum Technology Total				32 (7%)
Risk	25	What is the overall risk evaluation of the project?		
			No Risk	5
			Low risk	10
			Medium risk	20
			High risk	30
Maximum Risk Total				30 (7%)
Sponsorship	26	What is the level of management commitment		
			Management has made the project a priority	0
			Management is committed to the project	5
			Management has demonstrated interest	10
			Management is not committed	20
Maximum Sponsorship Total				20 (5%)
Maximum Potential Score				427